National Institute of Environmental Health Sciences

The periodicity of Plasmodium vivax and Plasmodium falciparum in Venezuela

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Abstract:

We investigated the periodicity of Plasmodium vivax and P. falciparum incidence in time-series of malaria data (1990-2010) from three endemic regions in Venezuela. In particular, we determined whether disease epidemics were related to local climate variability and regional climate anomalies such as the El Nino Southern Oscillation (ENSO). Malaria periodicity was found to exhibit unique features in each studied region. Significant multi-annual cycles of 2- to about 6-year periods were identified. The inter-annual variability of malaria cases was coherent with that of SSTs (ENSO), mainly at temporal scales within the 3-6 year periods. Additionally, malaria cases were intensified approximately 1 year after an El Nino event, a pattern that highlights the role of climate inter-annual variability in the epidemic patterns. Rainfall mediated the effect of ENSO on malaria locally. Particularly, rains from the last phase of the season had a critical role in the temporal dynamics of Plasmodium. The malaria-climate relationship was complex and transient, varying in strength with the region and species. By identifying temporal cycles of malaria we have made a first step in predicting high-risk years in Venezuela. Our findings emphasize the importance of analyzing high-resolution spatial-temporal data to better understand malaria transmission dynamics.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

El Nino Southern Oscillation, Temperature, Other Exposure

Temperature: Fluctuations

Other Exposure: sea surface temperature

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Central/South America

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Time Scale Unspecified